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QUALCOMM, INC
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EXAMINER	
GHULAMALI, QUTBUDDIN	
ART UNIT	**PAPER NUMBER**
2611	

DATE MAILED: 04/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/005,104	BJERKE ET AL.	
	Examiner	Art Unit	
	Qutub Ghulamali	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8 and 10-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-32 and 34-46* is/are rejected.

7)☒ Claim(s) *33* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/08/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Acknowledgment

1. This Office Action is responsive to the Remarks/Amendments filed on 01/25/2006.

Response to Remarks/Amendments

2. Applicant's arguments with respect to claims 1-8 and 10-46 have been considered but are moot in view of the new ground(s) of rejection. The applicant's argument (pages 10-16) regarding claims 1-9, 14-18, 20-30, 34-43 under 35 U.S.C. 102(b), is unfounded in view of applicant's amendments prompting new art rejection. The rejection based on new art follows.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-6, 13-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franz et al (USP 6,222,835) in view of Gerlach et al (USP 6,499,128).

With respect to claim 1, Franz discloses a method for recovering data transmitted in a wireless communication system comprising:

determining a first plurality of soft decision symbols for a first subset of the transmitted. coded bits based on the received plurality of modulation symbols and first extrinsic information for the transmitted coded bits (figs, 4, 5; col. 2, lines 35-41);

determining the first extrinsic information based on the first plurality of soft decision symbols (col. 2, lines 39-44);

repeating the determining a first plurality of soft decision symbols and the determining the first extrinsic information a plurality of times (col. 3, lines 16-20, 27-42);

determining (evaluated) decoded bits for the first subset of transmitted coded bits based on the first extrinsic information (col. 2, lines 50-56);

determining a second plurality of soft decision symbols for a second subset of the plurality of transmitted-coded bits based on the received plurality of modulation-symbols and second extrinsic information for the second subset of the plurality of transmitted coded bits (col. 2, lines 44-49);

determining the second extrinsic information based on the second plurality-of soft decision-symbols and wherein the second extrinsic information is independent of the first extrinsic information (col. 2, lines 44-49, 54-65);

repeating the determining a second plurality of soft decision-symbols and the determining the second extrinsic information a plurality of times (col. 3, lines 16-20, 27-42); and

determining decoded bits for the second subset of the plurality of transmitted coded bits based on the second extrinsic information (col. 2, lines 60-67; col. 3, lines 1-6). Franz however, does not explicitly disclose receiving a plurality of modulation symbols for a plurality of transmitted coded bits wherein the soft decision symbols. Gerlach in a similar field of endeavor discloses a system and method receiving a plurality of modulation symbols for a plurality of transmitted coded bits (series of modulated codewords) (col. 1, lines 53-61; col. 3, lines 16-22; col. 9, lines 11-20). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a method of receiving a plurality of modulation symbols for a plurality of transmitted coded bits as taught by Gerlach in the system of Franz because it can allow reception of coded information transmitted via a number of antennas and received at the receiver so that proper signal estimation and decoding can be performed.

As per claim 2, Franz discloses deriving first a priori information for the first subset of the plurality of the transmitted coded bits based on the received modulation symbols and the first information, and wherein the first plurality of soft decision symbols is determined based on the first a priori and the first extrinsic Information (page col. 5, lines 11-26, 28-37, 60-67).

With reference to claims 3, 15, 16, 23 and 24 Franz discloses the soft-decision symbols are represented as log-likelihood ratios (LLRs) and decoding is based on a concatenated convolutional decoding scheme (col. 1; lines 25-34).

Regarding claims 4, 17, Franz discloses the soft-decision symbols comprise channel information and extrinsic information (col. 2, lines 50-65).

As per claim 5, Franz discloses all claim limitations except, soft decision symbols comprise information for one or more spatial sub channels and one or more frequency sub channels used to transmit the plurality of modulation symbols.

Gerlach in a similar field of endeavor discloses spatial processing for soft decision symbol estimation and one or more frequency sub channel used to transmit plurality of modulation symbols (col. 9, lines 22-45; col. 10, lines 5-29). It would therefore, have been obvious to a person of ordinary skill in the art at the time the invention was made to use one or more spatial sub channels and one or more frequency sub channels to transmit plurality of modulation symbols as taught by Gerlach in the system of Franz because it can enhance efficiency and the iterative decoding may then apply any of the iterative decoding techniques to remove the effects of an iteratively applied convolutional code.

With reference to claims 6, 14, Franz discloses deinterleaving the soft decision symbols wherein the deinterleaved soft decision symbols is decoded (col. 4, lines 1-10); and

interleaving the first extrinsic information wherein the interleaved first extrinsic information is used to derive the soft decision symbols (col. 4, lines 1-10).

Regarding claim 13, Franz discloses deriving pre-coding interference based on the soft-decision symbols (col. 2, lines 32-44); and

canceling the pre-decoding interference estimates from input modulation symbols and wherein the input modulation symbols for a first transmit antenna are the received modulation symbols and the input modulation symbols for each subsequent transmit

antenna are the interference-cancelled modulation symbols from the current transmit antenna (col. 2, lines 38-60).

As per claim 18, Franz discloses soft-decision symbol for each coded bit comprises extrinsic information extracted from other coded bits (col. 2, lines 53-55).

Regarding claim 19, Franz discloses decoding is based on a parallel concatenated convolutional decoding scheme (col. 2, lines 5-20).

As per claims 20 and 21, Franz discloses decoding is based on a serial concatenated convolutional decoding scheme (col. 3, lines 1-10, 37-60).

As per claim 22, decoding is based on a block decoding scheme (col. 3, lines 5—55).

Regarding claim 25, Franz discloses plurality of modulation symbols are derived based on a non-Gray modulation scheme (col. 1, lines 25-34, 45-64).

Regarding claim 26, Franz discloses each transmit antenna are derived based on a respective modulation scheme (col. 1, lines 45-53).

5. Claims 10, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franz et al (USP 6,222,835) in view of Gerlach et al (USP 6,499,128) and further in view of Stefanov et al (IEEE Journal on selected areas in communication, vol. 19, No. 5).

Regarding claims 10, 11 and 12, Franz and Gerlach combined discloses all limitations of the claim except recovering a first subset of the modulation symbols for a transmit antenna by nulling a second subset of the modulation symbols for a second

transmit antenna. Stefanov in a similar field of endeavor discloses recovering a first subset of the modulation symbols for a transmit antenna by nulling a second subset of the modulation symbols for a second transmit antenna. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to recover a first subset of the modulation symbols by nulling a second subset for a second antenna as taught by Stefanov in the combined system of Franz and Gerlach because it can provide feasible demodulation with multiple antennas more efficiently minimizing the computational burden in the demodulation process.

6. Claims 7, 8, 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franz et al (USP 6,222,835) in view of Gerlach et al (USP 6,499,128) and further in view of Hochwald et al (US Pub. 2003/0076890).

With reference to claims 7, 8 and 40 Franz and Gerlach in combination discloses all limitations of the claim except a multiple-input and multiple-output (MIMO) system wherein the MIMO system implements orthogonal division multiplexing (OFDM). Hochwald in a similar field of endeavor discloses a wireless communication system having a multiple-input and multiple-output (MIMO) system wherein the MIMO system implements orthogonal division multiplexing (OFDM) (page 4, sections 0040, 0041). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a MIMO wherein the MIMO system implements orthogonal division multiplexing (OFDM) as taught by Hochwald in the combined system of Franz and Gerlach because use of MIMO, in a system of multiple transmit and receive antennas

for transmission of encoded information, can be exchanged in an iterative manner until a desired level of accuracy is achieved.

7. Claims 27-30, 34-39, 41-43 is rejected under 35 U.S.C. 103(a) as being unpatentable over Franz et al (USP 6,222,835) in view of Gerlach et al (USP 6,499,128) above, and further in view of Hochwald et al (US Pub. 2003/0076890).

With reference to claim 27, Franz and Gerlach combined discloses all limitation of the claim. Franz and Gerlach combination, however, is silent regarding detection of a plurality of modulation symbols for a plurality of transmitted coded bits. Hochwald in a similar field of endeavor discloses a method and apparatus wherein a detector (148) is operative to receive a plurality of modulation symbols for a plurality of transmitted coded bits, derive soft decision symbols for the coded bits based on the received modulation symbols and a second a priori information for the coded bits, and derive first a priori information for the coded bits based on the soft-decision symbols and the second a priori information (page 1, sections 0009, 0010, 0011; page 4, section 0040, 0041, 0044, 0046). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a multiple input multiple output detector as taught by Hochwald in the combined system of Franz Gerlach because the MIMO detector of Hochwald can provide soft information that can be exchanged in an iterative manner to achieve a desired level of accuracy.

As per claims 28, 46, Franz discloses deinterleaving (and means) the soft decision symbols wherein the deinterleaved soft decision symbols is decoded (col. 4, lines 1-10); and

interleaving (and means) the first extrinsic information wherein the interleaved first extrinsic information is used to derive the soft decision symbols (col. 4, lines 1-10).

As per claims 29 and 30, Franz discloses the soft-decision symbols are represented as log-likelihood ratios (LLRs) derived for the coded bits (col. 1; lines 25-34; col. 2, lines 10-20).

Regarding claim 34, Franz discloses one decoder is provided for each independently coded data stream to be decoded by the receiver (fig. 4, elements 14 (1-N)).

Regarding claim 35, Franz discloses decoding is based on a serial concatenated convolutional decoding on a first a priori information (col. 3, lines 1-10, 37-60).

As per claim 36, Franz discloses at least one decoder implements a maximum a posterior (MAP) decoding (col. 3, lines 30-50).

As per claim 37, Franz discloses a channel estimator operative to estimate one or more characteristics of a communication channel via which the plurality of modulation symbols are received (col. 2, lines 7-20, 31-36, 44-49); and

a transmitter unit operative to process and transmit channel state information indicative of the estimated channel characteristics (col. Col. 5, lines 11-20, 30-36).

With reference to claims 38 and 39, Franz discloses channel state information is indicative of a particular coding and modulation scheme to be used for each (all) transmit antenna(s) (col. 1, lines 47-52).

As per claims 41, 42 and 43, Franz discloses a system comprising of a receiver, transmitter with access point for communication as discloses in col. 1, lines 45-64; col. 2, lines 31-67; col. 6, lines 38-63).

8. Claims 31, 32 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Franz et al (USP 6,222,835) and Gerlach et al (USP 6,499,128) in view of Hochwald et al (US Pub. 2003/0076890) and further in view of Stefanov et al (IEEE Journal on selected areas in communication, vol. 19, No. 5).

Regarding claims 31, 45, Franz, Gerlach and Hochwald combined, discloses all limitations of the claim except, detector is further operative lo recover the modulation symbols for each transmit antenna by nulling the modulation symbols for other transmit antennas, and to derive soft-decision symbols for the coded bits transmitted from each transmit antenna based on the recovered modulation symbols for the transmit antenna and the second a priori information. Stefanov in a similar field of endeavor discloses detector is further operative lo recover the modulation symbols for each transmit antenna by nulling the modulation symbols for other transmit antennas, and to derive soft-decision symbols for the coded bits transmitted from each transmit antenna based on the recovered modulation symbols for the transmit antenna and the second a priori information (page 962, section IV). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use detector operative lo recover

the modulation symbols for each transmit antenna by nulling the modulation symbols for other transmit antennas, and to derive soft-decision symbols for the coded bits transmitted from each transmit antenna based on the recovered modulation symbols for the transmit antenna and the second a priori information as taught by Stefanov in the combined system of Franz, Gerlach and Hochwald because by use of the estimated channel information to obtain log-likehood of the received bits based on group interference suppression from other antennas more effectively.

Regarding claim 32, Franz, Gerlach and Hochwald combined, discloses all limitations of the claim except, detector is operative to multiply the received modulation symbols with a plurality of nulling matrices to derive the recovered modulation symbols for the plurality of frequency sub channels of each transmit antenna. Stefanov in a similar field of endeavor discloses detector is operative to multiply the received modulation symbols with a plurality of nulling matrices to derive the recovered modulation symbols for the plurality of frequency sub channels of each transmit antenna (page 962, section IV). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use detector operative to multiply the received modulation symbols with a plurality of nulling matrices to derive the recovered modulation symbols for the plurality of frequency sub channels of each transmit antenna as taught by Stefanov in the combined system of Franz, Gerlach and Hochwald because it can provide desired matrices used in the efficient computation of null space vectors.

9. Regarding claim 44, the steps claimed as apparatus is nothing more than restating the function of the specific components of the apparatus as claimed in the methods claim and therefore, it would have been obvious, considering the aforementioned rejection for the method claim 1, to a person skilled in the art at the time of the invention to device such a system.

Allowable Subject Matter

10. Claim 33 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US Patents:

Gupta (US Pub. 2003/0112901) discloses a method and apparatus for determining the log-likelihood ratio with pre-coding.

Cameron et al (US Pub. 2004/0240590) shows a decoder design adaptable to decode coded signals using min or max processing.

Edison et al (USP 6,856,656) discloses an iterative carrier phase tracking decoding system.

Edison et al (US Pub. 2002/0034261) shows a rate N/N systematic recursive convolutional encoder and corresponding decoder.

McFarland (USP 6,807,146) shows protocols for scalable system.

Boleskei et al (USP 6,442,214) discloses diversity transmitter and receiver.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Qutub Ghulamali whose telephone number is (571) 272-3014. The examiner can normally be reached on Monday-Friday, 7:00AM - 4:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

QG.
April 3, 2006.

JEAN B. CORRIELUS
PRIMARY EXAMINER
4-3-06